



J N 1 2 9 4 7 1

## PATENT COOPERATION TREATY

PCT/DK2003/000929

From the INTERNATIONAL BUREAU

## PCT

INFORMATION CONCERNING ELECTED  
OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

To:

CARLSSON, Eva  
Internationalt Patent-Bureau A/S  
Høje Taastrup Boulevard 23  
DK-2630 Taastrup  
DANEMARK

D T D I V

Date of mailing (day/month/year)

04 August 2005 (04.08.2005)

Applicant's or agent's file reference  
IPB/129471

## IMPORTANT INFORMATION

International application No.  
PCT/DK2003/000929International filing date (day/month/year)  
22 December 2003 (22.12.2003)

Priority date (day/month/year)

Applicant

NIRO A/S et al

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

**EP:** AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR  
**National:** BG, CA, CN, CZ, DE, JP, KP, KR, MN, NO, PL, RO, RU, SK, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

**AP:** BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW  
**EA:** AM, AZ, BY, KG, KZ, MD, RU, TJ, TM  
**OA:** BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG  
**National:** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BR, BW, BY, BZ, CH, CO, CR, CU, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MW, MX, MZ, NI, NZ, OM, PG, PH, PT, SC, SD, SE, SG, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1) (a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3) (b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Authorized officer

Simin Baharlou

Facsimile No. +41 22 740 14 35

Facsimile No. +41 22 338 71 30



J N 1 2 9 4 7 1

## PATENT COOPERATION TREATY

PCT 2005

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY



D T M Y N S K R

PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY

(PCT Rule 71.1)

To:

CARLSSON, Eva  
Internationalt Patent-Bureau AS  
H je Taastrup Boulevard 23  
DK-2630 Taastrup  
DANEMARK

Date of mailing  
(day/month/year)

28.10.2005

Applicant's or agent's file reference  
IPB/129471

## IMPORTANT NOTIFICATION

International application No.  
PCT/DK2003/000929

International filing date (day/month/year)  
22.12.2003

Priority date (day/month/year)  
22.12.2003

Applicant  
NIRO AS et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

## 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international  
preliminary examining authority:



European Patent Office - P.B. 5818 Patentlaan 2  
NL-2280 HV Rijswijk - Pays Bas  
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl  
Fax: +31 70 340 - 3016

Authorized Officer

Jülich, G

Tel. +31 70 340-3935





# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference IPB/129471		<b>FOR FURTHER ACTION</b>		See Form PCT/PEA416
International application No. PCT/DK2003/000929		International filing date (day/month/year) 22.12.2003	Priority date (day/month/year) 22.12.2003	
International Patent Classification (IPC) or national classification and IPC B05B7/10				
Applicant NIRO AS et al.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 2 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand 30.06.2005		Date of completion of this report 28.10.2005		
Name and mailing address of the international preliminary examining authority:		Authorized Officer		
 <p>European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016</p>		<p>Brévier, F</p> <p>Telephone No. +31 70 340-2816</p> 		

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/DK2003/000929

## Box No. 1 Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4)
- ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

### Description, Pages

1-16 as originally filed

### Claims, Numbers

1-12 received on 17.09.2005 with letter of 14.09.2005

### Drawings, Sheets

1/4-4/4 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/DK2003/000929

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	1-12
	No: Claims	
Inventive step (IS)	Yes: Claims	1-12
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/DK2003/000929

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

Reference is made to the following document/s/:

D1: US-B-6 142 388 (ENVIROCARE INT INC) 2000-11-07

The document D1 is regarded as being the closest prior art to the subject-matter of claims 1 and 11, and shows (the references in parentheses applying to this document):

A nozzle for atomising a liquid by means of a gas, comprising a mixing chamber (20, 88) extending between an upstream end (110) and a downstream end, at least one liquid inlet (discharge plane 80) and at least one tangential gas inlet (105) to said mixing chamber (20), and an outlet positioned at the downstream end of said mixing chamber (20, 88), whereby a centre body (125) having a generally converging configuration, seen in the flow direction, is provided in the mixing chamber (20, 88).

The subject-matter of claim 1 differs from this known nozzle in that:

-at least one liquid inlet (6c) is positioned at or near the upstream end (3a) of said mixing chamber (1) and in the upstream direction with respect to said at least one gas inlet (5).

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as producing droplets of narrow size distribution with a reduced gas consumption in an internal mixing nozzle.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

By providing the liquid inlet (6c) at or near the upstream end (3a) of said mixing chamber (1) and in the upstream direction with respect to said at least one gas inlet (5) a better mixing/atomisation can take place.

Document D1 teaches on the contrary that the liquid outlet should be positioned downstream of the gas inlet in order to prevent the gas to deflect the course of the liquid.

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

**PCT/DK2003/000929**

Method claim 11 refers to the use of a nozzle according to claim 1 and therefore also meets the requirements of the PCT with respect to novelty and inventive step.

Claims 2-10 and 12 are dependent on claim 1 respectively claim 11 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Claims

1. A nozzle for atomising a liquid by means of a gas, comprising a mixing chamber (1) extending between an upstream end and a downstream end, at least one liquid inlet (6c) and at least one tangential gas inlet (5) to said mixing chamber, and an outlet (4) positioned at the downstream end of said mixing chamber (1), characterized in that a centre body (2) having a generally converging configuration, seen in the flow direction, is provided in the mixing chamber (1), and that said at least one liquid inlet (6c) is positioned at or near the upstream end of said mixing chamber (1) and in the upstream direction with respect to said at least one gas inlet (5).
2. A nozzle as claimed in claim 1, wherein the centre body (2) comprises a cylindrical base portion (2a) and a converging portion (2b).
3. A nozzle according to any one of claims 1 to 2, wherein the downstream end of said centre body (2) is positioned outside the outlet (4) of the nozzle.
4. A nozzle according to any one of claims 1 to 3, wherein the mixing chamber (1) comprises a cylindrical portion and a converging portion, said at least one gas inlet (5) being provided in the cylindrical portion.
5. A nozzle according to any one of claims 1 to 4, wherein said mixing chamber (1) is provided in a chamber part (9).
6. A nozzle according to any one of claims 1 to 5, wherein the centre body (2) forms an integral part of an insert (10).
7. A nozzle according to claim 6, wherein the in-



18

sert (10) comprises a disk portion (23) positioned at the upstream end of the centre body (2), said disk portion (23) forming at its downstream face (3) the upstream end of said mixing chamber (1).

5 8. A nozzle according to claim 6 or 7, wherein said insert (10) at its upstream end is connected with a bottom part (7), which in turn is connected with a cap part (8), said chamber part (9) being positioned within said cap part (8) and in connection  
10 with said insert (10).

9. A nozzle according to any one of claims 1 to 8, wherein one gas inlet (5) is provided tangentially with respect to the inner circumference of the mixing chamber (1).

15 10. A nozzle according to any one of claims 1 to 9, wherein said centre body (2) is adjustable in the axial direction.

11. A method of atomising a liquid by means of a gas in a nozzle according to any one of claims 1 to  
20 10, wherein the area of the gap defined between the inner periphery of the outlet (4) and the centre body (2) is designed and a gas pressure chosen so that two sonic jumps takes place during operation, a first jump taking place when the gas enters the mixing  
25 chamber (1), and a second jump when the gas-liquid mixture leaves through the outlet gap (4).

12. A method according to claim 11, wherein said method is for spray drying, spray cooling, agglomeration or spray coating.

30